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PAD RETAINING SYSTEM IN DISC BRAKES FOR ROAD VEHICLES, ESPECIALLY UTILITY VEHICLES
[BELAGHALTERUNG IN SCHEIBENBREMSEN FÜR STRASSENFAHRZEUGE, INSBESONDERE NUTZFAHRZEUGE]

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Description /1*

PAD RETAINING SYSTEM IN DISC BRAKES FOR ROAD VEHICLES, ESPECIALLY UTILITY VEHICLES

The invention relates to a pad-retaining system according to the general concept in Claim 1.

In disc brakes, especially partial pad disc brakes of known construction that can be used both in passenger cars and in utility vehicles, pad carriers and/or carrier plates that hold friction pads and can be introduced into pad shafts are used that are pressed against the brake disk by brake application means for the purpose of braking. When driving over uneven roads, very high accelerations occur at the wheel and vehicle axles and thus on the brake that is rigidly connected to the vehicle axle, the magnitudes of which can be estimated at 20 G. The pad carriers are exposed to such accelerations and have a tendency to impact the insides of the pad shafts and their guides with great imbalance, preferentially perpendicular to the ground plane, so these forces can act in their full scope on the components of the disc brakes.

To prevent rattling of the pads and/or impact on the guide surfaces in the pad shafts, allowing leaf springs to act on the outer edge of the pad carriers is known, which puts the brake pad overall under spring tension. In order to be able to carry out a fast pad change with the least possible effort, a holding shackle held by the /2 brake caliper housing, e.g., bolted to it, is provided that acts on

*Numbers in the margin indicate pagination in the foreign text.

the leaf springs and presses them with pre-stress against the outer edge of the pad carrier. Holding shackles of this type are fastened on the brake caliper housing with threaded connections or with simple pin connections, among other things. Pin connections have the disadvantage that when the pins are driven out an explosion-like stress relief of the highly stressed pad-holding springs can occur which, in the worst case, can result in personal injury. With threaded connections, this problem can be prevented by a suitable selection of the screw length that provides an engagement of the screw in the nut thread up to the stress-relieved state of the spring, but because of the operating changes to the disc brakes (heat, cold, soiling, moisture) a corrosion of the screws cannot be prevented completely. This can lead to a case in which the screw head is sheared off in an attempt to loosen it and thus the same problem of an explosion-like stress relief occurs as exists in pin connections as described above.

Disc brakes for utility vehicles with brake pads dimensioned with large surface areas have pressure distribution plates that are used to distribute the brake application forces, which can be introduced into shafts of the brake caliper in a manner similar to the pad carrier plates and are secured in the same way by means of holding springs against rattling and impact on the guide walls. In this type of pressure distribution plates, which are generally arranged between the mechanical tensioning element and the pad carrier plate, problems of the type mentioned above can also occur if the holding shackle that acts both on the pad carrier as well as on the pressure distribution

plate is removed.

Starting from this, the object of the invention consists in designing a pad-retaining system of this general type in such a way that the removal of the brake pad and/or the pressure distribution plate can be carried out without problems without the danger of the explosion-like expansion of the leaf springs. /3

To achieve this object, the characteristics are used according to the characterizing part of Claim 1.

The structure of both the pad carrier and the leaf spring is chosen so that it is very simple in design and still has an absolutely safe method of operation, whereby the leaf springs, when stressed, can be guided with their recesses over the holding brackets in such a way that the holding brackets pass through their recesses when the leaf springs are completely or partially stress-relieved and the leaf spring is held captive. During disassembly of the brake pad and/or the pressure distribution plate, even if there is a shearing of the threaded connection that is used to fasten the holding shackle, an explosion-like expansion and release of the leaf spring does not have to be considered since the leaf spring remains hooked tightly and held on the holding shackles after partial stress relief.

One advantage of the captive holding of the leaf springs on the pad carrier and/or on the pressure distribution plate also consists in that a preliminary assembly of the leaf springs can be carried out, e.g., in the shop, i.e., installation the leaf springs under tight installation conditions is no longer necessary.

Advantageous designs and further developments are listed in the other patent claims:

In the following, the invention will be explained using an embodiment example with reference to the attached drawings.

Fig. 1 shows a partial side view of a pad carrier plate with holding brackets formed on it in which (indicated with solid lines) the leaf spring is located in attached position, while the shape of the leaf spring in released, stress-relieved state is shown in dotted lines; /4

Fig. 2 is a top view of the leaf springs in their as-installed condition on the pad carrier;

Fig. 3 is a top view of the leaf springs shown in dotted lines in Fig. 1 in their released state;

Fig. 4 is an enlarged partial view of one of the holding brackets with representation of the undercut formed on it.

Fig. 1 of the drawing shows a simplified partial side view of a pad carrier that is generally the top end when installed, and of a pad carrier **1**, which is designed, e.g., as a carrier plate and can be introduced with the friction pad (not shown) fastened on it into the pad shaft of a disc brake. In this case, on the pad carrier, eyes **3** can be provided by means of which the pad carrier can be pulled out of the pad shaft. Inside the pad shaft the friction pad (not shown) lies opposite a brake disc (not shown) in a known way, whereby in a way that is also known tensioning elements are active in order to press the friction pads against the brake disc, preferably on both sides.

After introduction by means of a leaf spring **5**, the pad carrier and/or pressure distribution plates are held in their pad shaft, which in turn is secured by a holding shackle that acts from the top side on the leaf spring and extends in the direction perpendicular to the longitudinal axis of the leaf spring.

The holding shackle **7** that is shown in a face view in Fig. 1 and /5 in partial top view in Fig. 2 can be attached with one end to an abutment (not shown) or similar holding element of the brake caliper housing and on the opposite end can preferably be stressed with a screw against the brake caliper housing in such a way that with the help of the holding shackle **7** a force directed downward according to the representation in Fig. 1 is exerted on the leaf springs **5** and thereby on the pad carrier **1**. In the embodiment shown in the drawing, the leaf spring **5** is provided with a lateral collar **9** against which the holding shackle comes to rest; in interaction with the holding shackle, the leaf spring **5**, i.e., in the center area, can also be designed in a different way in order to absorb the tensioning forces of the holding shackle.

For the purpose of spring tensioning of the pad carrier **1**, the leaf spring **5** can be tensioned against spring force by the holding shackle **7** whereby in installed condition the leaf springs **5** have a configuration that is more greatly flattened in comparison to the released state, as can be seen from Fig. 1. The released state of the leaf spring is shown in dotted lines in Fig. 1, i.e., the condition before installation of the leaf spring on the pad carrier, while solid

lines show the installation condition of leaf spring **5** on the top side of the pad carrier **1** during tensioning by the holding shackle **7**. In installed condition, an open space **13** exists between the underside of leaf spring **5** and the outer edge **11** of the pad carrier **1** which permits the spring movements of the pad carrier relative to the leaf spring.

Between the brackets **17** of pad carrier **1** that hold the eyes **3** and its center axis, holding brackets **19** extend from the outer edge **11** of the pad carrier and the two ends of the leaf spring can be attached in these holding brackets. The leaf spring has recesses **21** for this, through which the holding brackets **19** can be passed through when the leaf spring is stressed. The distance of the holding brackets **19** from the two sides of the center axis, as well as the distance of the /6 recesses **21** from both sides of the center part **15** of the leaf spring, is selected in such a way that the lateral shanks **23** of the leaf spring **5** can only be guided and hooked through the holding brackets **19** when they are in stressed state. The fastening of the leaf springs on the outer edge **11** of the pad carrier can occur when the pad carrier is loosened from the brake caliper or can be carried out immediately after insertion of the pad carrier into the pad shaft, in any case the fastening occurs before the subsequent positioning and screwing down of holding shackle **7** which, after its fastening, exerts a force that is directed downward on the leaf spring **5** positioned on the pad carrier. If the disc brake is exposed to high impacts, i.e., very high accelerations, when the vehicle is in movement, movements of the pad

carrier that are directed outward will be opposed with the help of the leaf spring **5**; a rattling of the pads and/or an impact on the guide surfaces in the pad shaft are hereby prevented.

In Fig. 4 of the drawing, it can be seen that the holding brackets **19** have undercuts **25** on the outside, i.e., in a position turned toward the eyes **3**. In installed condition of the leaf spring **5**, in which it is already somewhat pre-stressed by the holding shackle **7**, the two holding brackets **19** engage through the windows and/or recesses **21** in the two shanks **23** in the manner shown in Fig. 1, i.e., the leaf spring **5** is held captive on the holding brackets **19**, whereby the two outer edges of the recesses **21** have no contact with the holding brackets. When a pad carrier is replaced, the leaf spring can be taken off the holding brackets **19** if the holding shackle **7** has previously been loosened from its holding position by loosening its screw connection (not shown) on the brake caliper. During this loosening, i.e., swinging away of the holding shackle **7**, or during an unintended shearing of the screw connection, since the leaf spring **5** is held on pad carrier **1** described above, no explosion-like separation of the leaf spring from the pad carrier can occur. This is because since the leaf spring, as explained, is fastened on the pad carrier and /7 loosening is only possible if, by using suitable tools or in another way, the leaf spring **5** is pressed downward in such a way that the shanks **23** having recesses **21** can be lifted off of the holding bracket as a result of the resulting stretching of the leaf springs.

The views according to Fig. 4 and according to Fig. 1 show that the holding brackets preferably have slopes **27** in the area of the outer edge; these slopes simplify the installation of the leaf spring since they can be pressed with spring force over the slopes in order to assume the position on the pad carrier shown with solid lines in Fig. 1.

According to Figures 1-3, the leaf spring **5** can be rounded on both ends **29** pointed toward the top in such a way that the ends lie at the transition to brackets **17** as shown in Fig. 1. However, the invention is not restricted to an embodiment of the leaf springs of this type, i.e., the basic principle on which the invention is based of holding the leaf springs on the pad carrier can also be provided with different types of designs of the leaf spring ends as well as with a different shaping of the eyes provided on the pad carrier for pulling them out of the pad shaft.

Leaf springs of the type described preferably consist of spring steel of a known composition. The manufacturing of such leaf springs can be carried out in a very simple way, i.e., they can be manufactured with the simplest tools. In the same way, it is very simple with respect to manufacturing engineering to provide holding brackets **19** of the construction and method of operation described above on pad carrier 1.

Reference Number List /8

1 Pad carrier

3 Eye

5 Leaf spring

7 Holding shackle

9 Collar

11 Outer edge

13 Open space

15 Center part

17 Bracket

19 Holding bracket

21 Recess

23 Shank

25 Undercut

27 Slope

29 End

Patent Claims /9

1. Pad-retaining system in disc brakes for road vehicles, especially utility vehicles, with pad shafts provided on a brake caliper and/or brake housing, preferably on both sides of the brake disc to be braked, into which pad carriers holding friction pads, and possibly also pressure distribution plates can be introduced, whereby holding shackles or similar hold-down elements act on the outer edges of the pad carrier and possibly on the pressure distribution plates, characterized in that on the outer edge of the pad carrier (1) and/or

of the pressure distribution plates, on both sides of the center axis running in sliding direction, collar-like holding shackles (19) are provided which when the leaf springs (5) are installed pass through recesses (21) formed on their lateral shanks (23) in such a way that an automatic loosening is prevented in a stress-relieved or partially stress-relieved condition.

2. Pad-retaining system according to Claim 1, characterized by the following characteristics:

a) The holding shackles (19) are designed as projections that project like a collar from the outer edge (11) of the pad carrier (1) and/or the pressure distribution plate which when the leaf springs (5) are installed engage in the recesses (21) of the two shanks (23) of the leaf springs in such a way that the outer edge of the recess lies in an undercut (25) on the outer edge of the holding shackle (19);

b) The leaf spring (5) has a curvature such that the recesses /10 (21) can be guided through the holding brackets (19) without obstacles for the purpose of installing the leaf springs in their stressed state.

3. Pad-retaining system according to Claim 1 or 2, characterized in that the leaf springs (5) have rounded ends (29) that when installed contact the transition of the brackets (17) that are used to pull the pad carrier (1) out.

4. Pad-retaining system according to one of the preceding claims, characterized in that the center part (15) of the leaf spring (5), in its installed position, is at a distance from the outer edge (11) of

the pad carrier and/or the pressure distribution plate in such a way that an adequate open space (13) is made possible for the spring movements of the pad carrier (1) and/or the pressure distribution plate with respect to the center part (15) of the leaf spring (5) held by the holding shackle (7).

5. Pad-retaining system according to one of the preceding claims, characterized by a collar projecting from the center part (15) of the leaf spring (5) on which the holding shackle (7) that is screwed or attached in another way presses the leaf spring (5) with pre-stress when installed on the brake caliper and/or brake housing.

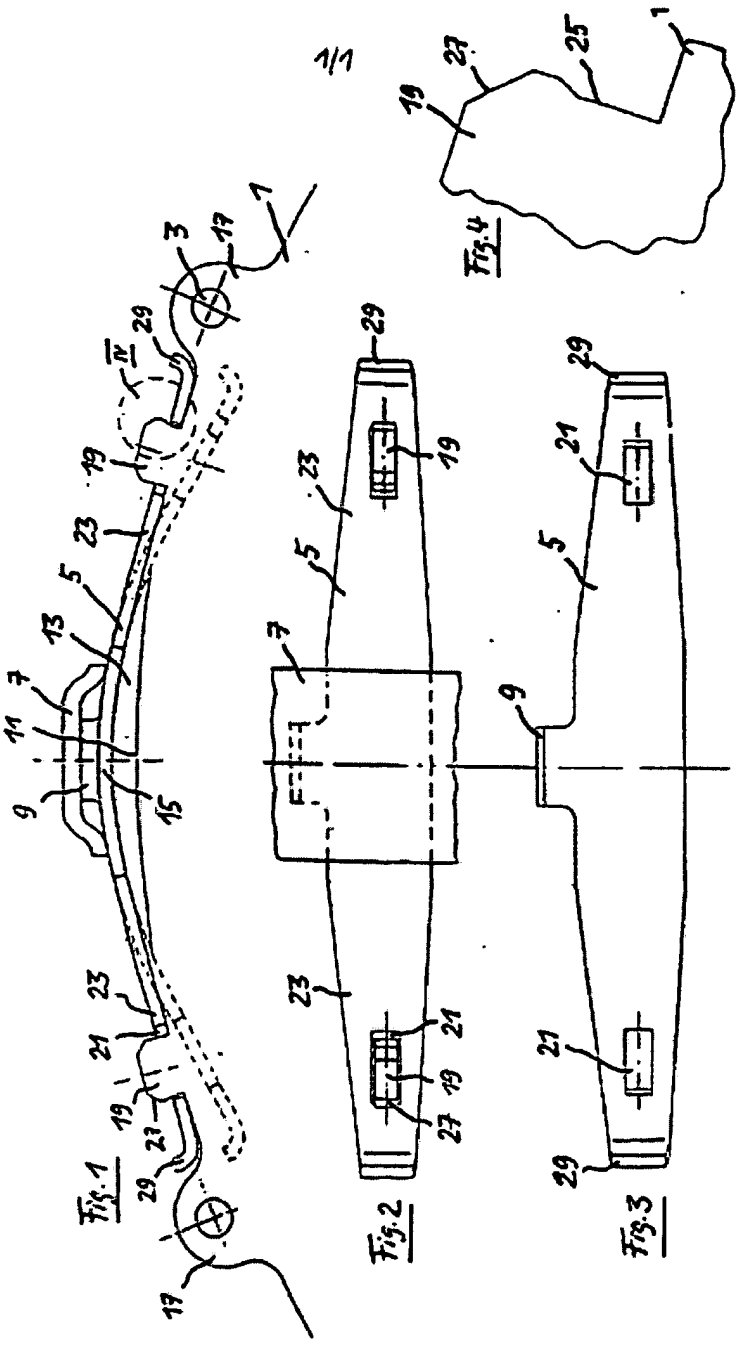

Fig.1

Fig.2

Fig.3

Fig.4